What is claimed is:

1. A signature simulator comprising:

    a ground truth tool comprising:

        a first input of atmosphere conditions; and

        a second input of field data; and

        an output of selected data; and

    a simulation module comprising:

        a first input of an agent absorption coefficient;

        a second input of system performance

            requirements; and

        an output.

2. The simulator of claim 1, further comprising:

    a training data module comprising:

        an input connected to the output of the

            simulation module; and

        an output.

    a sequestered test data module comprising:

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an input connected to the output of the

simulation module and;

an output.

3. The simulator of claim 2, further comprising an algorithm development module comprising:

a first input connected the output of the training

data module;

a second input; and

an output.

4. The simulator of claim 3, further comprising a detection performance test and evaluation module comprising:

a first input connected to the output of the

sequestered test data module;

a second input connected to the output of the

algorithm development module; and

an output connected to the second input of the

algorithm development module.

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5. A simulation system comprising:

an atmospheric radiance and transmission modeling
module;

an atmospheric conditions source connected to the
atmospheric radiance and transmission modeling
module;

a sensor response removal module;

a field data source connected to the sensor response
removal module;

a sensor response source connected to the sensor
response removal module;

a special characteristics addition module connected to
the sensor response removal module;

an atmospheric attenuation module connected to the
atmospheric radiance and transmission modeling
module and to the special characteristics
addition module; and

a sensor response addition module connected to the

sensor response source and to the atmospheric

attenuation module.

6.   The system of claim 5, wherein the sensor response

addition has a simulated data output.

7.   A simulator system comprising:

a chemical agent detection environment simulation

device;

a user interface connected to the chemical agent

detection environment simulation device;

a background measurement environment interferogram

source connected to the chemical agent detection

environment simulation device;

a numerical computing tool connected to the chemical

agent detection environment simulation device;

and

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an atmospheric transmittance and radiance model

connected to the chemical agent detection

environmental simulation device.

8.   The system of claim 7, further comprising an ancillary
information source connected to the chemical agent
detection environment simulation device.

9.   The system of claim 8, wherein:

files may be input to the atmospheric transmittance

and radiance model from the chemical agent

detection simulation device environment; and

atmospheric model information may be input to the

chemical agent detection environment simulation

device from the atmospheric transmittance and

radiance model.

10.   A simulation method comprising:

computing parameters of a plurality of parameters of

spectrums;

calibrating a background spectrum;

constructing an atmospheric model;

construction a cloud model; and

building simulated spectra from the plurality of
parameters of spectrums, the background spectrum,
the atmospheric model and the cloud model.

11. The method of claim 10 further comprising signal-to-noise compensation of the simulated spectrum.

12. A means for simulating comprising:

means for computing parameters for at least one
spectrum;

means for calibrating a background spectrum;

means for constructing an atmospheric model;

means for constructing a cloud model;

means for simulating a signature from the at least one
spectrum, the background spectrum, the
atmospheric model and the cloud model.

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13. The means of claim 12, further comprising a means for improving a signal-to-noise factor of the signature.

14. A system for simulation comprising:

a user interface;

an atmospheric simulation module connected to the user interface;

a sensor radiation and response module connected to the user interface;

a cloud radiance and transmittance module; and

a synthesizer connected to the atmospheric simulation module, the sensor radiation and response module, and the cloud radiance and transmittance module.

15. The system of claim 14, further comprising a data storage module connected to the synthesizer.

16. The system of claim 15, wherein the sensor radiation and response module, the cloud radiance and transmittance module and the synthesizer are operated with a numerical computing tool.

17. The system of claim 16, wherein the numerical computing tool is a Matlab® module.

18. The system of claim 16, wherein the atmospheric simulation module is a MODTRAN module.

19. A signature simulator comprising:

an input stage;

a preparation stage;

a calibration stage; and

a simulation stage; and

wherein the simulation stage comprises:

a background spectrum;

an atmospheric model;

a cloud model; and

a simulated spectrum builder.

20. The simulator of claim 19 wherein calibration stage comprises:

computing an ambient blackbody spectrum;

computing a theoretical ambient blackbody spectrum; and

computing a calibrated background spectrum.

21. The simulator of claim 20, wherein the calibration stage further comprises computing an LN_2 reference spectrum.

22. The simulator of claim 21, wherein the simulated spectrum builder may output a simulated signature.